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Vertical breast measurement in East Asian women: A guide for mastopexy and reduction to form nonptotic breasts in unilateral prosthetic breast reconstruction

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Summary *Background:* Following unilateral breast cancer surgery, mastopexy and reduction of the unaffected breast are often performed to obtain symmetrical breasts. The use of implants in breast reconstruction results in a nonptotic breast. To achieve symmetry following the procedure, the unaffected side should be nonptotic too. However, no study has yet reported any indices for the design of mastopexy and reduction in this direction. We present a new method of preoperative design that uses vertical breast measurements to form nonptotic breasts according to individual breast shapes.

Methods: We performed vertical breast measurements of the unaffected breasts of 193 patients scheduled to undergo surgery for unilateral breast cancer. The vertical base dimension (VBD) and vertical surface dimension (VSD) of the ptotic and nonptotic breasts and the height of the nipple in the nonptotic breast were measured in centimeters.

Results: The borderline between ptotic and nonptotic breasts was expressed using the formula $VSD = 1.13 \times VBD + 1.86$. The height of the nipple in nonptotic breasts was 0.8 times the distance between the sternal notch and lowest point of the inframammary fold on the midline. From these findings, we formulated a new method for forming a nonptotic breast from a ptotic breast using an inverted T design.

Conclusion: These results can be used for the design of mastopexy and reduction when forming a nonptotic breast on the unaffected side. These procedures can be performed without

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significantly lifting the nipple–areolar complex if required during unilateral prosthetic breast reconstruction.

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Introduction

During breast reconstruction after unilateral breast cancer surgery, mastopexy and reduction of the unaffected breast are often performed to obtain symmetrical breasts. Ptotic breasts can be formed by breast reconstruction with autologous tissue. Moreover, a ptotic postoperative breast shape following mastopexy and reduction of the unaffected side is unproblematic as long as there is no difference between the left and right breasts. However, in cases of implant reconstruction, the unaffected side should preferably be nonptotic because the use of an implant results in a nonptotic reconstructed breast.¹ Preoperative marking is important for this type of surgery, and determining the length of the skin of the breast in the longitudinal orientation in particular is essential.² Previous studies have described the measurements of normal breasts^{3–6} and those regarded as exceptionally cosmetically pleasing.^{7,8} Furthermore, most surgeons base their preoperative marking on these data and on their own experience. Thus, they perform preoperative marking with reference to the mean or the recommended values of a range of parameters, particularly the distance from the sternal notch (SN) to the nipple and from the nipple to the inframammary fold (IMF). However, given the variety in the longitudinal diameter and volume of the breasts of individual patients, in many cases, these mean values or the recommended ones are not actually applicable in practice. No study has yet reported indices for design to form a nonptotic breast on the unaffected side when this is required because of unilateral breast reconstruction with an implant. Thus, a new method of preoperative design that can be adapted for use in individual patients is required. We considered that the length of the skin of the breast in the longitudinal orientation is an important factor when determining the shape of the breast. Therefore, we have introduced a procedure that uses vertical breast measurements to implement preoperative designs in accordance with the shape of the individual breast. We describe here the detailed measurements and the design of mastopexy or reduction to form a nonptotic breast on the unaffected side when implants are used for breast reconstruction.

Patients and methods

We obtained measurements of the unaffected breast during the preoperative examinations of the patients that were scheduled to undergo surgery for unilateral breast cancer at our hospital. These measurements were

performed on 193 patients between January 2014 and December 2015. The measured parameters were the vertical base dimension (VBD), which was defined as the distance between the SN and the intersection of the IMF and a straight line drawn caudad from the nipple, and the vertical surface dimension (VSD), which was defined as the distance between the SN and IMF. VBD was measured using calipers and VSD was measured using a tape that was passed over the nipple. Ptotic breasts were lifted up by hand while the measurements were obtained (Figure 1). For nonptotic breasts, we measured the distance between the SN and position of the nipple on the midline (NM) and the distance between the SN and the position of the IMF on the midline (IMFM). Furthermore, the ratio of these two distances (SN–NM/SN–IMFM) was calculated (Figure 2). Breasts were defined as nonptotic if there was no contact between the skin of the breast and the skin of the chest wall in the standing position and as ptotic if there was contact. The statistical software used was BellCurve for Excel (Social Survey Research Information Co., Ltd., Tokyo, Japan).

Results

Of the 193 patients, 153 had nonptotic breasts, whereas 40 had ptotic breasts. Patient demographics are shown in Table 1.

The relationship between ptosis and VSD

For the 153 patients with nonptotic breasts, VBD ranged between 19.2 and 25.1 cm, with a mean value of 22.4 cm, whereas VSD ranged between 20.5 and 29.8 cm, with a mean value of 24.2 cm. For the 40 patients with ptotic breasts, VBD ranged from 19.7 to 25.9 cm, with a mean value of 23.1 cm, whereas VSD ranged from 26.0 to 39.5 cm, with a mean value of 31.3 cm. The distributions are shown in Figure 3. For the same VBD value, the VSD of the ptotic breasts was longer than that of the nonptotic breasts. The discriminant function of the threshold value between ptotic and nonptotic breasts as calculated by the discriminant analysis was $VSD = (1.13 \times VBD) + 1.86$.

Nipple position in nonptotic breasts

The SN–NM/SN–IMFM ratio in the 153 patients with nonptotic breasts ranged from 0.68 to 0.89, with a mean value of 0.78. The distribution is shown in Figure 4. In nonptotic breasts, the nipple was positioned averagely so that the SN–NM/SN–IMFM ratio was approximately 0.8.

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